

Skin tryptophan and crossed-linked collagen levels are significantly reduced by hydroxycinnamic acid.

Dayan N. Lipo Chemicals Inc.

Introduction

Exposure of the skin to Ultraviolet (UV) radiation can induce changes in the intensity of different native fluorophors, both at the epidermis and dermis levels. Those variations allow tracking changes related to chronological aging and photo aging, as well as to differentiate between healthy and disordered skin (1). Using spectrofluorimetric instrumentation one can distinguish between a 295nm band that originates from the amino acid tryptophan (TP) in the epidermis, and a 340nm band that corresponds with levels of pepsin-digestible cross-linked collagen (PDC) in the dermis. It was demonstrated that while tryptophan levels may be elevated due to exposure to UVB radiation (photo-aging), cross-linked collagen levels would increase with time due to chronological aging.

In this study we followed changes in levels of TP and PDC in Asian skin, which consisted over a period of 8 weeks, following an application of an emulsion containing either hydroxycinnamic acid (HCA), magnesium ascorbyl phosphate (MAP) or hydroquinone (HQ).

Methodology

A panel of nine female subjects of Asian decent applied an emulsion containing one of the above active compounds on the forearm twice daily for 8 weeks. Measurements of baseline, 2, 4, 6 and 8 weeks, were taken using Spex SkinSkan® spectrofluorometer (Jobin Yvon, Edison, NJ). This instrument is a highly sensitive fiber-optic spectrofluorometer designed for a non-invasive *in vivo* measurement on skin. The excitation spectrum with a peak maximum at 295nm has been correlated with the levels of TP and the 340nm peak was correlated with the PDC. Data was calculated by subtracting the peak height value of the untreated site from the value of the treated site.

Results and discussion

The mechanism by which ultraviolet radiation ages the skin and its relation to chronological aging is known to involve the generation of reactive oxygen species (ROS'S that can be neutralized by anti-oxidant. One of the methodologies to follow biochemical alterations in the skin that result from photo exposure and chronological aging is the measurement of skin auto fluorescence (2). Selected molecules in the skin will absorb light at one wavelength and emit it at a higher wavelength. Tryptophan, which has auto fluorescence, is an important precursor for melanin biosynthesis, as well as other pigment intermediates in the skin (3, 4, 5). Cross-linked collagen is elevated in mature skin and is related to chronological aging (6). It was also shown that topical application of anti-oxidants, such as green tea extract and vitamins E and C can block the generation of fluorescent molecules in the skin, and this obstruction was correlated with the delay of skin aging related to collagen (7).

The results plotted in the figures shown include variations in TP levels in response to treatment. While at week two there is no significant difference in reduction in TP levels between the three actives, by week 4, MAP and HQ are shown to decrease TP levels significantly more then HCA. This trend however, is reversed at weeks 6 and 8, when HCA surpasses both MAP and HQ to create a major reduction in the TP peak.

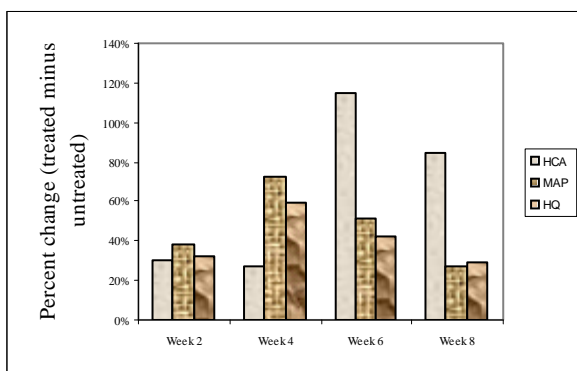


Figure 1: Percent reduction in tryptophan peak levels.

Further analysis of the changes occurring at weeks 6 and 8 of the experiment yielded interesting information about the effect of the actives on PDC levels. While the effect of the MAP is shown to be insignificant, both HQ and HCA reduce levels of PDC. HCA was superior to HQ especially at week 8, where the reduction in PDC was doubled in comparison to HQ.

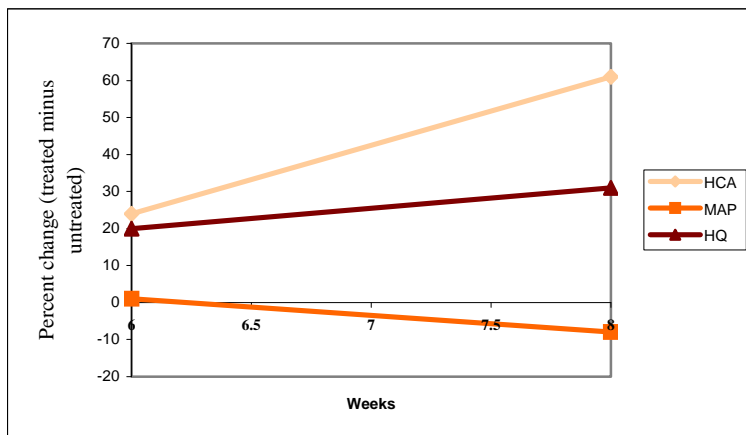


Figure 2: Percent reduction in pepsin-digestible cross-linked collagen levels

Conclusions

This study demonstrates the effect of three commercially available skin-brightening actives in the cosmetic market on the levels of TP and PDC in a pilot Asian panel. It shows the superiority of HCA in reduction in levels of both compounds, providing insights to mechanisms by which HCA as anti-oxidant is hypothesized to rejuvenate aged skin.

Further studies are required to better support these data as well as to understand the correlation between these effects and visual changes in the skin.

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